

# International Collaboration with Environment Canada: Road Weather



Richard Lam

Tim Steffen

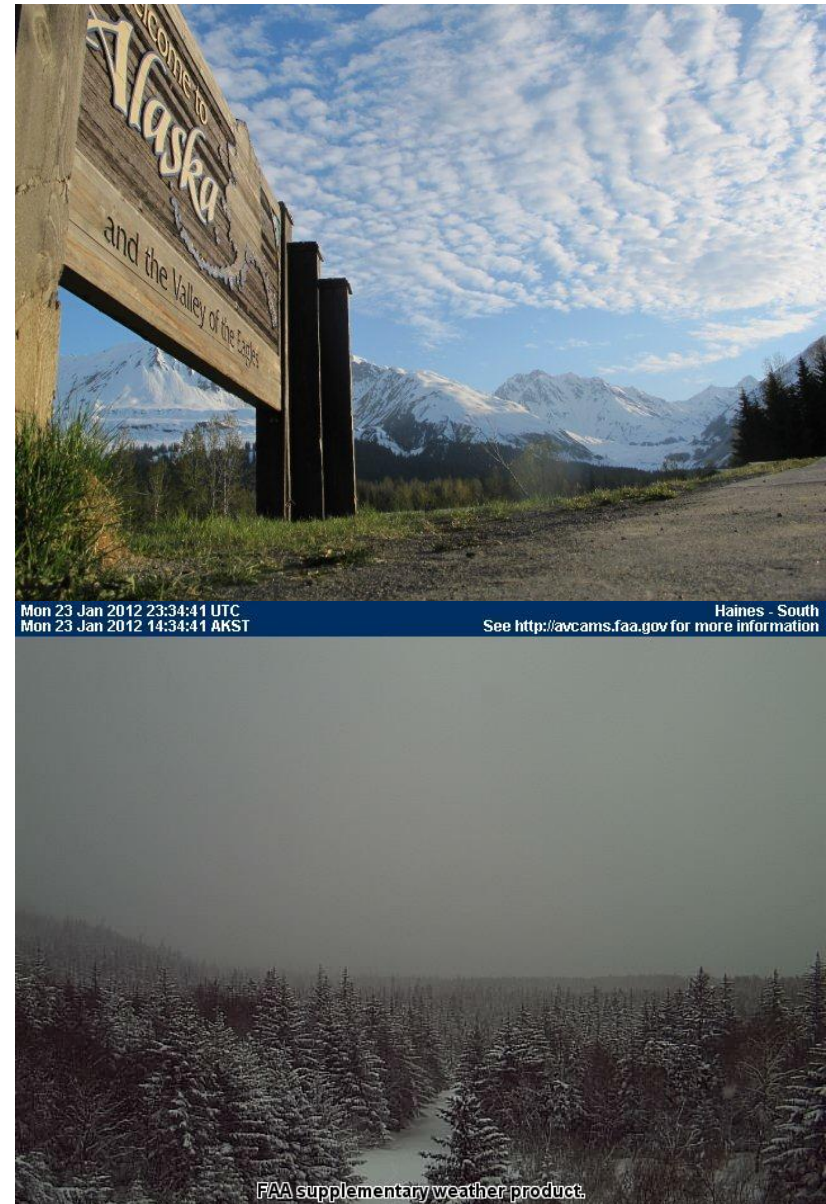
Tom Ainsworth

NWS Juneau Forecast Office



# Introduction

- Haines/Klondike Highways
- Forecast Tools
- Collaboration with Environment Canada
- Daily Product Issuance
- Winter Weather Patterns in SE Alaska
- Case Study
- Future Considerations



# Area Map





# Road Forecast Begins on October 1st

Whitehorse

Haines Junction

Carcross

Haines Road (Canada)

South Klondike Highway (Canada)

Yukon

British Columbia

White Pass

Klondike Highway (U.S.)

Alaska

Pleasant Camp

Haines Highway (U.S.)

Skagway

Haines



Environment Canada



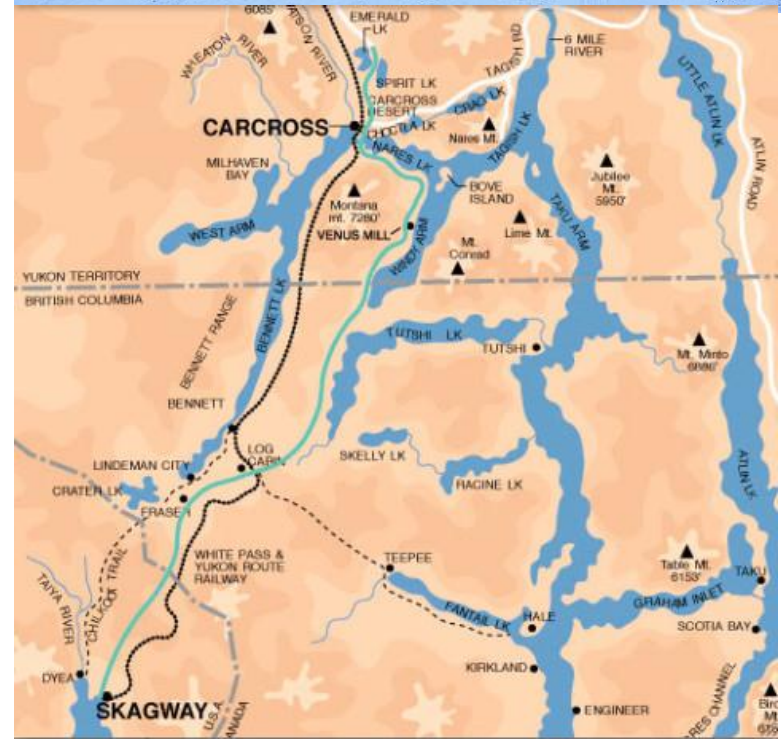


# Klondike Highway

- Starts near Skagway
- Length: 15 miles from Downtown Skagway
- Ends at US/Canada Border (Elevation: 3300 feet)
- Continues into Carcross and connects with Alcan Highway and Whitehorse
- Residents, tourists, fuel and ore trucks
- 150,000 vehicles crossed the border in 2011 (Alaska DOT)
- Peak Season: Summer

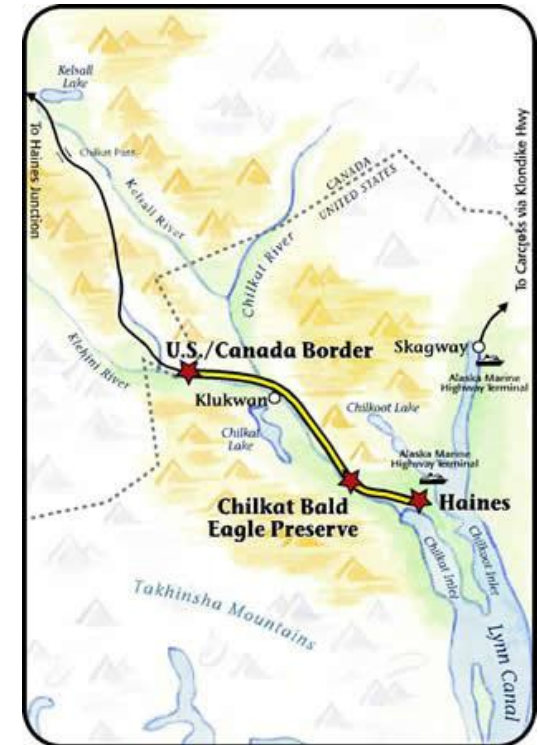


Courtesy: Murray Lundberg



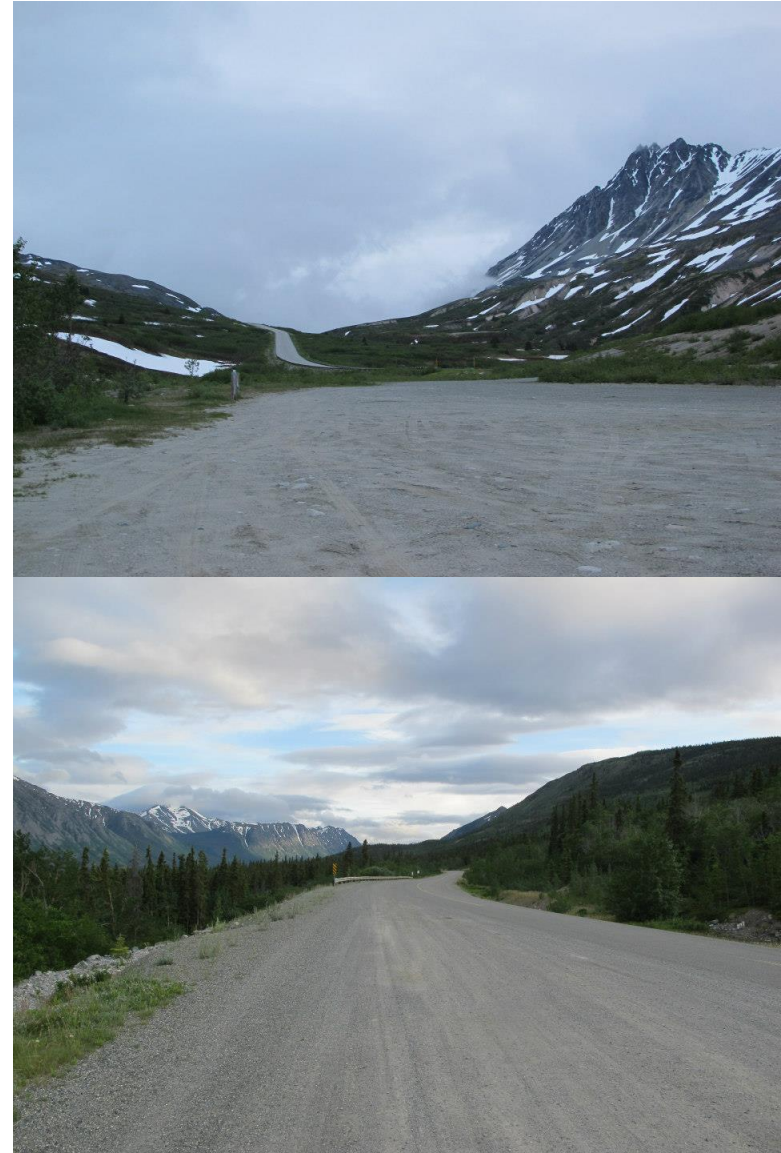
# Haines Highway

- Starts near Haines
- Length: 44 miles from Ferry Terminal
- Chilkat River Valley: 1 to 2 miles wide
- Ends at US/Canada Border (Elevation: 800 feet)
- Continues into Haines Junction, Yukon and connects with Alcan Highway.
- Residents, travelers, tourists
- 80,000 vehicles crossed the border in 2011 (Alaska DOT)
- Peak Season: Summer



# Notable Issues along the Highways

- No Gas Stations
- Minimal cell phone coverage
  - No coverage outside of Skagway and Haines
  - Tough for users to obtain/report highway and weather conditions
- Road closure
  - Heavy Snow
  - Avalanches
  - Road Maintenance (AKDOT)





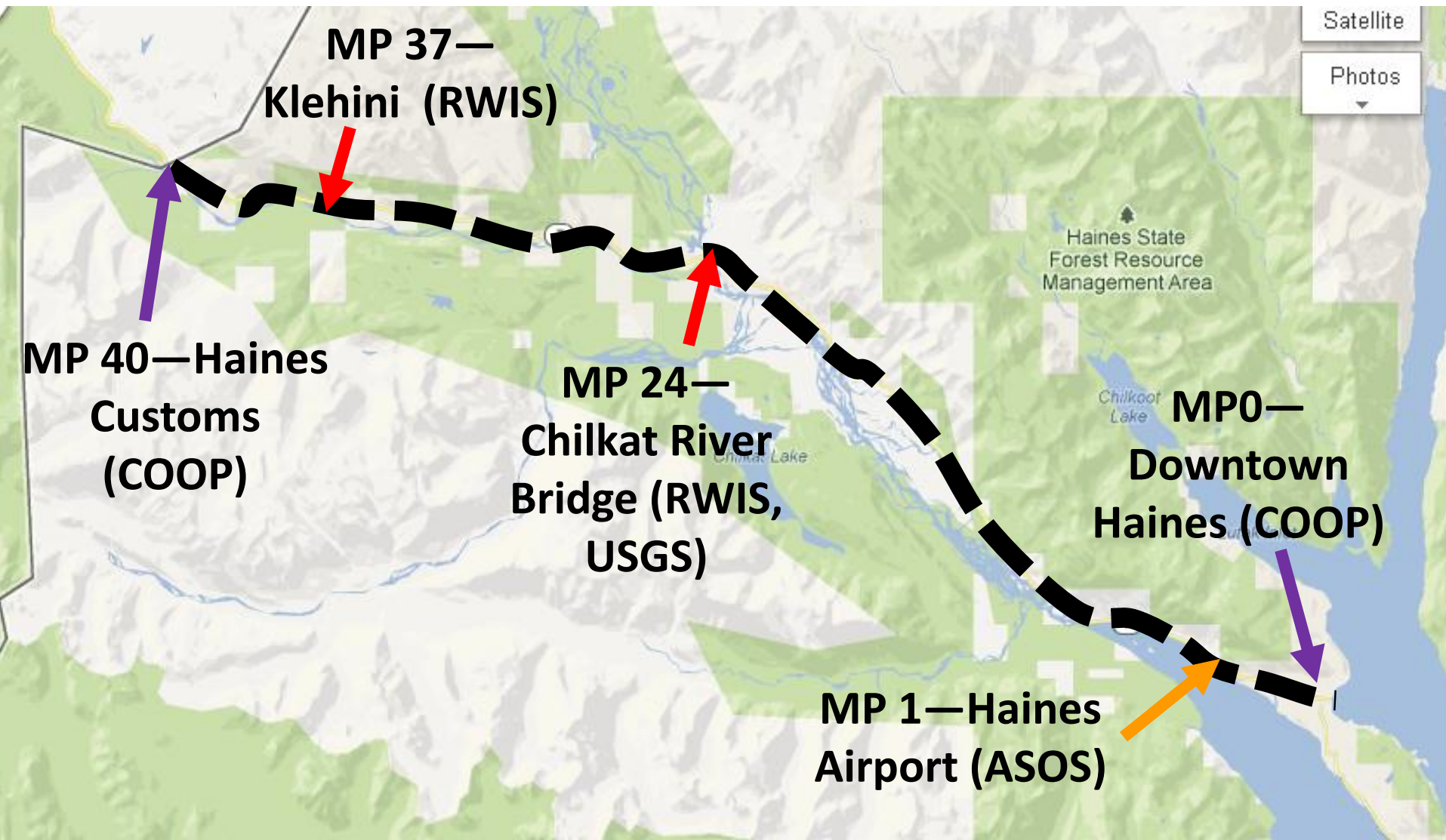
# Forecast Tools—Weather Observations

- ASOS
  - Doesn't report snow accumulation
  - Report precipitation type
  - Hourly observations
  - Visibility → snowfall rate
- COOPs and Spotters
  - Daily observations
  - Report snow accumulation
  - Can call them to obtain weather update
- RWIS
  - 20 to 30-min observations
  - Doesn't report snow accumulation
- SNOTELs
  - Real-time snow depth





# Forecast Tools—Weather Observations

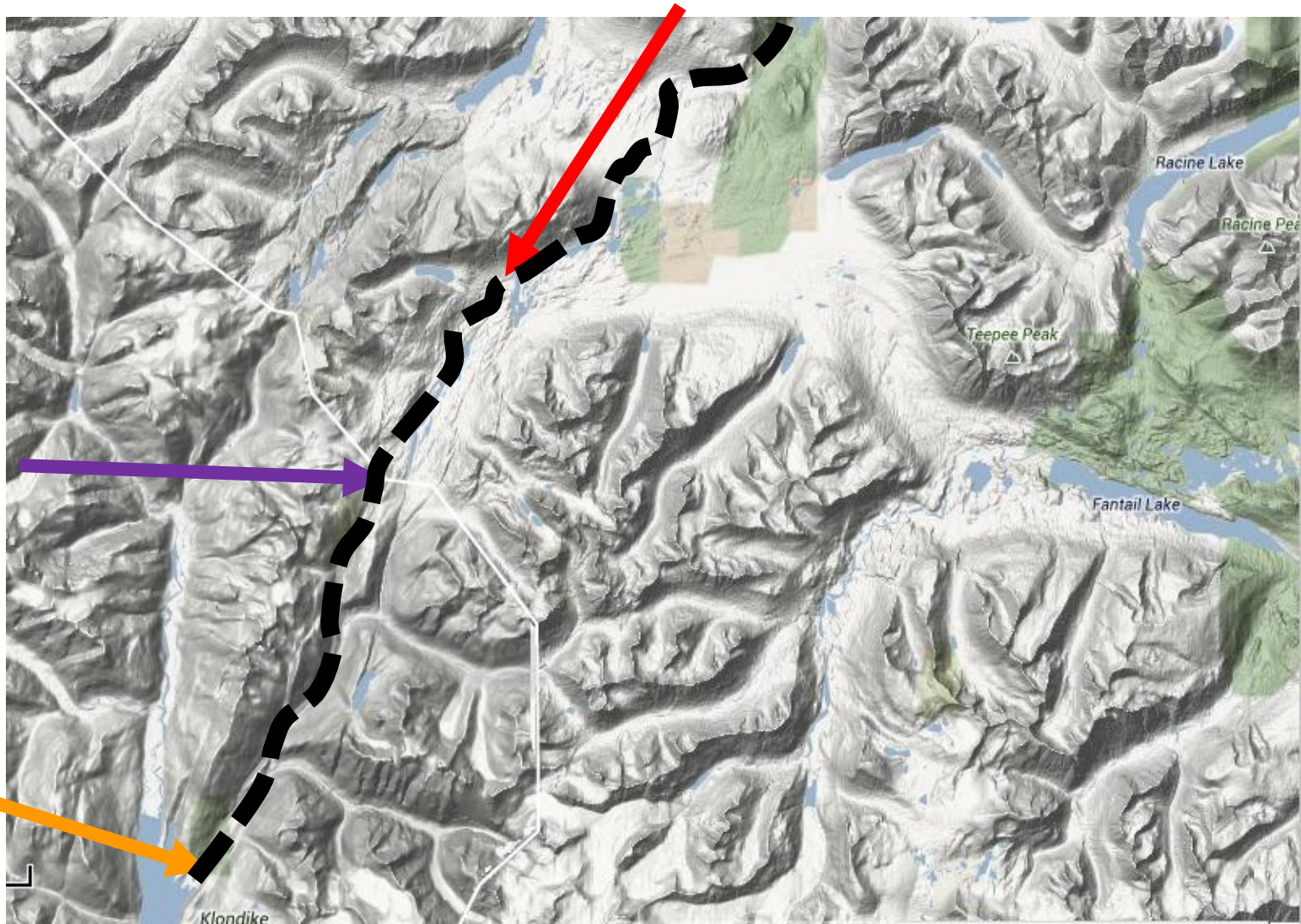


# Forecast Tools—Weather Observations

Fraser Camp, BC (Wx Obs)

MP 15—  
White Pass  
(RWIS)

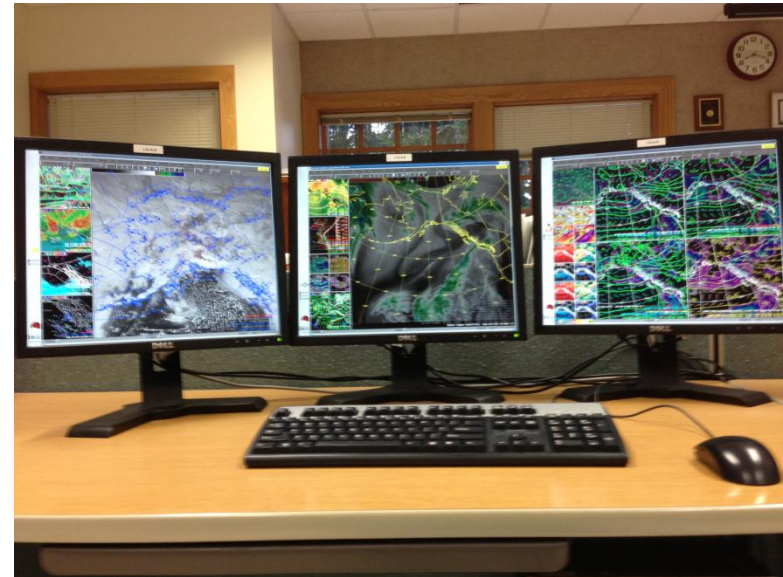
MP 0—  
Skagway  
Airport  
(ASOS)





# Forecast Tools—AWIPS

- VIS: 6 hours per day
- IR: tough to infer snowfall from high cloud top temperatures (low clouds)
- WV: coarser resolution
- Night-time Microphysics RGB (new):
  - Thin/thick clouds (red)
  - Ice/water clouds (green)
  - Cold/warm surface (blue)
  - Fog
- Satellite Precipitation Estimates (new)
- Radar: No coverage
- Numerical Models
- Hi-Res Models
- Graphical Forecast Editor



# Forecast Tools—Webcams

- Provide current weather conditions
  - Haines Highway
    - Downtown Haines (Mile 0)
    - Chilkat River Bridge (Mile 24)
    - Klehini (Mile 37)
  - Klondike Highway
    - Downtown Skagway (Mile 0)
    - White Pass (US/Canada Border)
    - Fraser Camp (British Columbia)
- Lighting issues in winter





# Collaboration

- Intra-office coordination
  - Road forecast derived from GFE
  - Feedback from long-term and short-term forecasters
- Inter-office coordination with Environment Canada in Vancouver, BC
  - Unit Conversion
  - Coordination via phone on forecast discrepancies if needed
  - Social Media

# Product Issuance

- Road Forecasts
  - Issued at 6 am, 10 am, and 5 pm Daily
  - Klondike Highway (US), South Klondike Highway (Canada)
  - Haines Highway (US), Haines Road (Canada)
- Road Observations
  - Issued by 9 am Daily
  - 15 locations along Klondike and Haines Highways
  - Current weather conditions including (snowfall, visibility, winds)



# Road Forecast (US)

SOUTH KLONDIKE HIGHWAY - SKAGWAY TO WHITE PASS

**...WINTER WEATHER ADVISORY FROM 7 AM THIS MORNING TO 10 AM AKDT THURSDAY NEAR WHITE PASS...**

**...STRONG WIND FROM LATE THIS EVENING THROUGH THURSDAY MORNING NEAR TAIYA INLET...**

**.TODAY...**RAIN...MIXED WITH SNOW IN THE MORNING. **NEAR WHITE PASS...SNOW.** **LITTLE OR NO SNOW ACCUMULATION NEAR SEA LEVEL...RANGING TO 3 TO 5 INCHES NEAR WHITE PASS.** **SNOW LEVEL RISING TO 1500 FEET IN THE AFTERNOON.** HIGHS AROUND 44...RANGING TO 32 NEAR WHITE PASS. SOUTH WIND 15 TO 25 MPH. GUSTS AROUND 35 MPH NEAR TAIYA INLET DIMINISHING IN THE MORNING.

**.TONIGHT...**WINDY...**RAIN SHOWERS...EXCEPT SNOW SHOWERS NEAR WHITE PASS.** SNOW LEVEL 2900 FEET. SNOW ACCUMULATION 3 TO 5 INCHES NEAR WHITE PASS. LOWS AROUND 41...RANGING TO 31 NEAR WHITE PASS. **SOUTH WIND 25 TO 35 MPH WITH GUSTS TO AROUND 50 MPH. STRONGEST WINDS NEAR SKAGWAY.**

**.THURSDAY...**WINDY. RAIN LIKELY. NEAR WHITE PASS...SNOW WITH SNOW ACCUMULATION 1 TO 3 INCHES. SNOW LEVEL 2500 FEET. HIGHS AROUND 46...RANGING TO AROUND 35 NEAR WHITE PASS. SOUTHWEST WIND 25 TO 35 MPH.

# Road Forecast (Canada)

SOUTH KLONDIKE HIGHWAY - WHITE PASS TO CARCROSS  
...**WINTER STORM WARNING IN EFFECT**....

**.TODAY...**SNOW. AMOUNT 2 INCHES EXCEPT 4 NEAR WHITE PASS. WIND BECOMING SOUTH 25 MPH. GUSTS TO 45 MPH DEVELOPING NEAR WHITE PASS GIVING REDUCED VISIBILITY IN BLOWING SNOW. HIGH MIDDLE 30S EXCEPT IN THE UPPER 20S AT WHITE PASS.

**.TONIGHT...**PERIODS OF SNOW. AMOUNT 2 TO 4 INCHES EXCEPT 4 TO 6 NEAR WHITE PASS. WIND SOUTHWEST 20 MPH EXCEPT GUSTING UP TO 45 MPH NEAR WHITE PASS GIVING REDUCED VISIBILITY IN BLOWING SNOW. TEMPERATURE STEADY NEAR UPPER TWENTIES EXCEPT NEAR 30 AT FRASER.

**.THURSDAY...**SNOW ENDING NEAR NOON THEN MAINLY CLOUDY. AMOUNT UP TO 2 INCHES NEAR WHITE PASS. WIND SOUTHWEST 20 MPH. EXCEPT GUSTING TO 45 MPH NEAR THE PASS GIVING REDUCED VISIBILITY IN BLOWING SNOW. HIGH MIDDLE 40S EXCEPT MIDDLE 30S AT WHITE PASS.



Weather Roundup For South Klondike and Haines Highways

900 AM Thursday May 2, 2013

South Klondike Highway Weather Observations Between 7-9 AM Thursday

Mile	Location	SkyWx	Temp	Vsby	Wind	24Hr Pcpn	24Hr Snow	24Hr Max	24Hr Min
0.0	Skagway Airport	Mostly Cloudy	45	10+	S22G29	0.14	M	46	35
6.8	US Customs	M	36	M	S10	M	0.0	M	M
15	Summit/Border	M	32	M	S15	M	0.0	M	M
22.5	Fraser	Cloudy	33	5	S15	M	2.0	44	33
66	Carcross	Cloudy	43	10+	SW11	T	0.0	43	26

Haines Highway Weather Observations Between 7-9 AM Thursday

Mile	Location	SkyWx	Temp	Vsby	Wind	24Hr Pcpn	24Hr Snow	24Hr Max	24Hr Min
0.0	Haines	Cloudy	42	5	E8	0.63	T	42	32
3.5	Haines Airport	Cloudy	43	10+	E11G20	0.56	M	43	35
23.8	Chilkat Rvr Bridge	M	40	M	E2	0.17	M	41	35
36.6	Klehini	M	41	M	E9	0.08	M	41	34
40.4	US Customs/Border	Cloudy	37	M	M	0.05	0.0	40	32
88	Blanchard	Cloudy	36	5	SW19	M	0.8	36	28
151	Haines Junction	Cloudy	44	10+	SW2	0.00	0.0	46	27

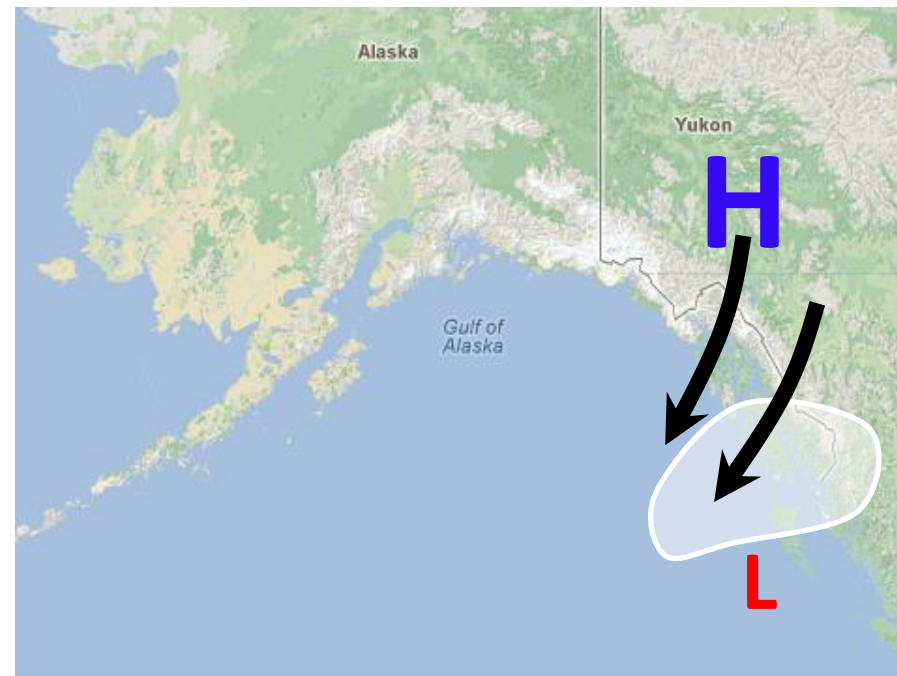
Alaskan Highway Weather Observations Between 7-9 AM Thursday

Mile	Location	SkyWx	Temp	Vsby	Wind	24Hr Pcpn	24Hr Snow	24Hr Max	24Hr Min
635	Watson Lake	Mostly Cloudy	34	10+	CALM	0.1	T	36	28
918	Whitehorse	Cloudy	39	10+	SE14G21	M	M	39	28
1202	Beaver Creek	Cloudy	25	10+	CALM	M	M	32	9

# Winter Weather Regimes in SE Alaska—Northerly Flow

- Strong arctic high over Yukon and Interior Alaska
- Low south of Panhandle
- Dry pattern
- Gusty northerly winds
- Sub-freezing temperatures
- Precondition for winter precipitation

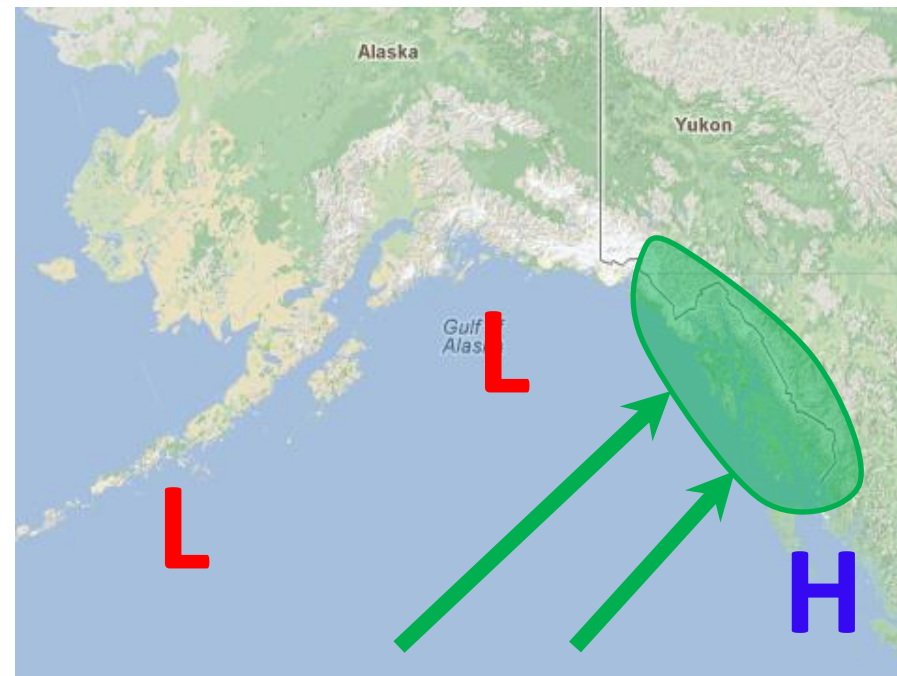
Surface Map



# Winter Weather Regimes in SE Alaska—Southwesterly Flow

- Strong Aleutian low
- Strong North Pacific High
- Strong warm moist advection
- Atmospheric River
- Rain (heavy at times) across Panhandle
- Snow in northern areas if preexisting arctic airmass persists

Surface Map

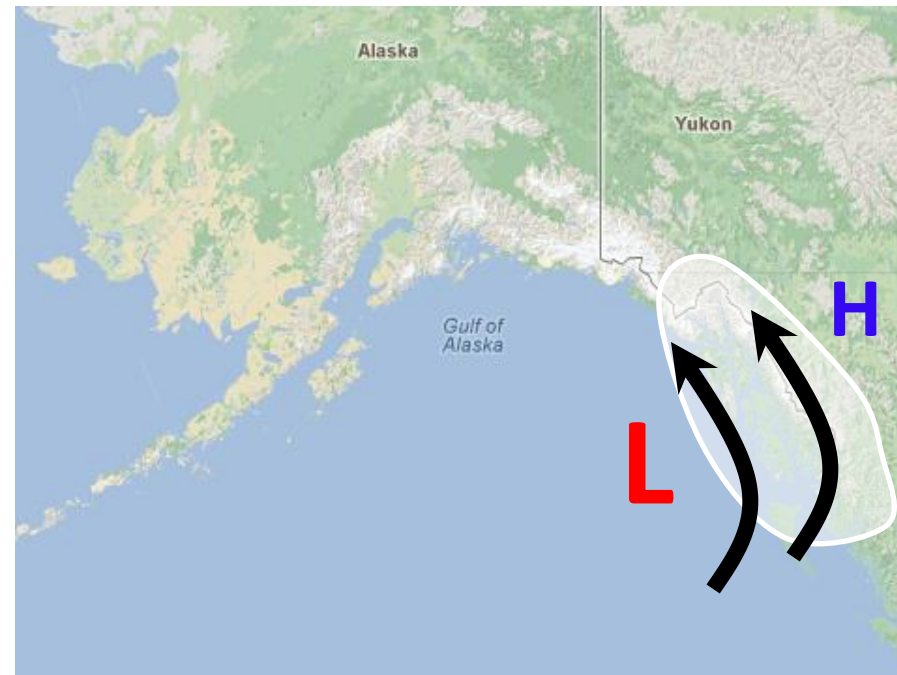




# Winter Weather Regimes in SE Alaska—Southeasterly Flow

- Low in Southeast Gulf
- Polar high in NW Canada
- Warm advection
- Moisture advection
- Pre-existing cold air in northern Panhandle
- Overrunning stratiform precipitation
- Snow changeover to rain
- **Wind shifts**
- Accumulations highly variable
- Juxtaposition of cold air and moisture

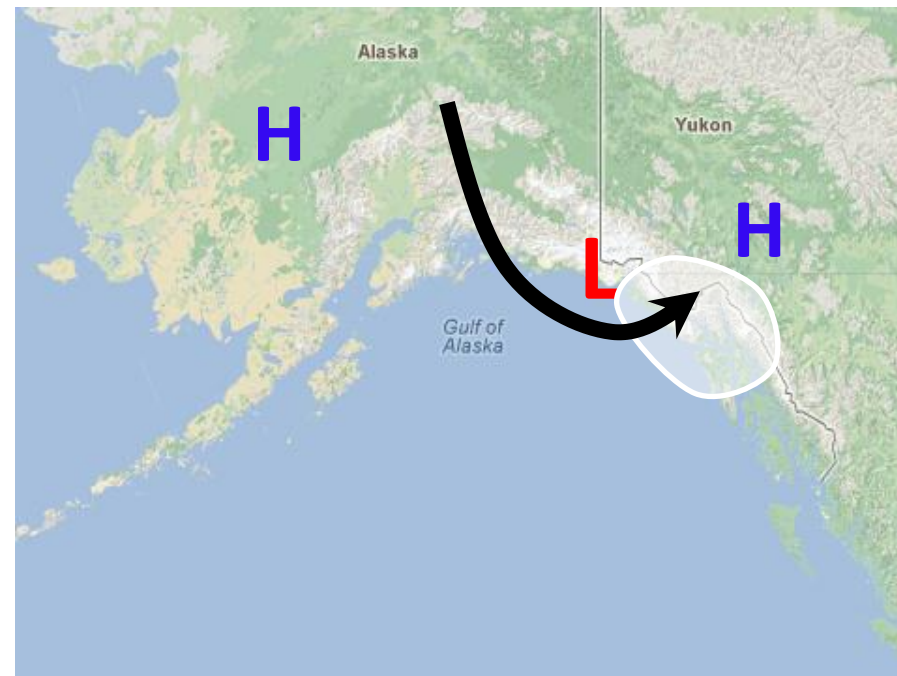
Surface Map



# Winter Weather Regimes in SE Alaska—Cross-Gulf Flow

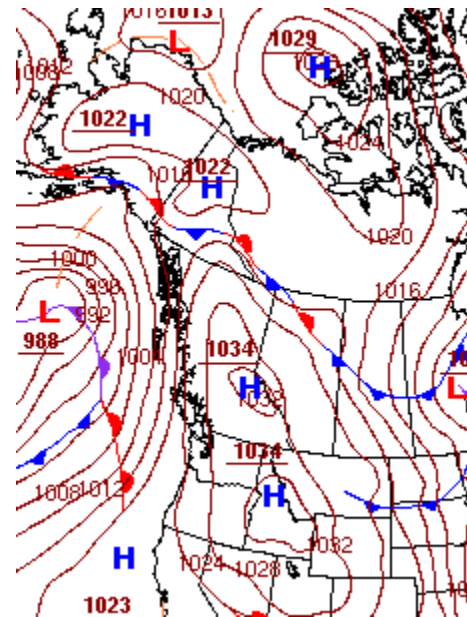
- Low in NE Gulf
- Highs in western Alaska and NW Canada
- Cold air traveling over warm Gulf waters
- Showers and convection
- Deformation bands
- Heavy snowfall rates
- Training precipitation
- Surprise snowfall amounts

Surface Map



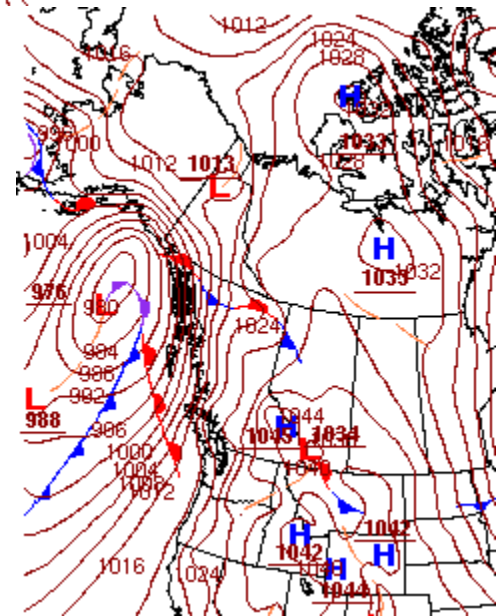
# Heavy Snow Event—Synopsis

- January 1<sup>st</sup> to 2<sup>nd</sup>, 2012
- Preexisting arctic airmass
  - -40 F in Interior Alaska
  - -30 F in Yukon
- Upper flow from SW advects moisture into Panhandle
- Strong surface low moving into the Gulf of Alaska
- Overrunning situation
- Arctic Front enhances precipitation rates
- Terrain effect also enhances additional snowfall



1/1/2012 0Z

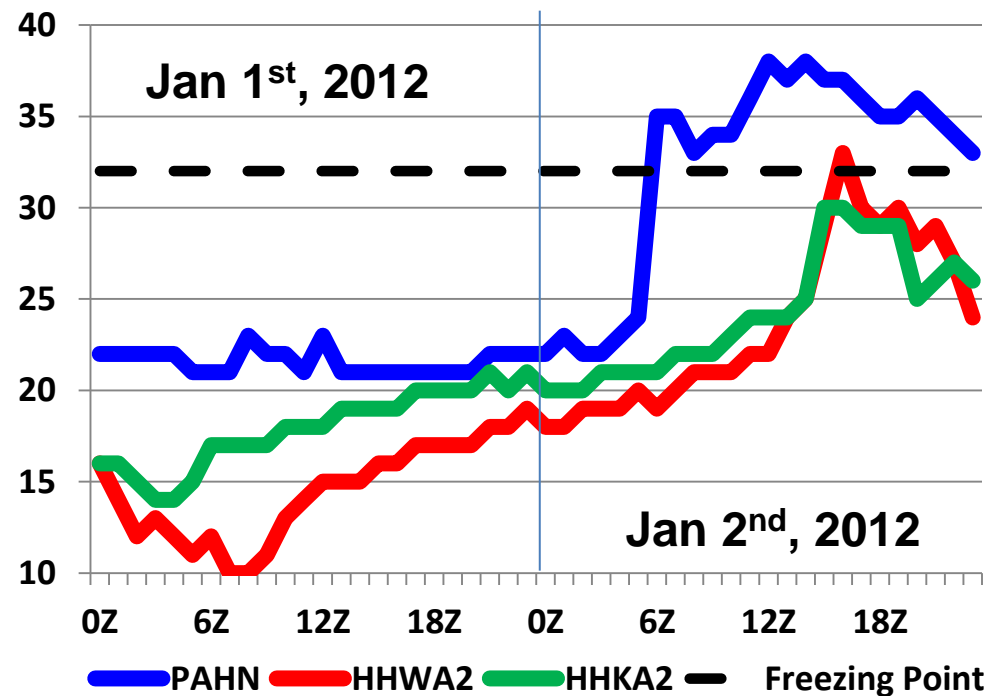
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# Heavy Snow Event—Impacts

- Along the Haines Highway
  - Temperature remained below freezing for the whole event
  - Winds remained calm
- Near Downtown Haines
  - Temperatures jumped up to the mid-30s in the overnight hours
  - Wind shift to easterly and gusting up to 40 mph
- Haines Customs
  - 42" snow
  - 2.20" liquid
  - 18 F to 28 F
- Downtown Haines
  - 16.1" snow
  - 1.53" liquid
  - 20 F to 36 F



# Future Considerations

- Forecasts highly complex due to local topography and lack of observations
  - Collaboration in acquiring more observations in the region to gain understanding about winter weather in SE Alaska/NW Canada
- Supercomputer at UAF to initiate case studies on individual events
- To improve skill score for snowfall forecasts along Klondike and Haines Highways
  - Higher “hit”
  - Lower “false alarm”
  - Lower “missed event”
- Decision Support Services with DOTs, EMs, and other stakeholders
- Social Media (Facebook, Twitter, NWSChat)

